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FIRST
CLASS



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WANG MODEL 700A/B ELECTRONIC CALCULATOR



DESCRIPTION

The WANG 700A/B is the most advanced programmable electronic calculator on today's market. The following units are included in one self-contained desk-top unit:

Display, Keyboard, Read-only Memory (ROM), Core Memory, Tape Drive.

DISPLAY

Two rows (X & Y) are displayed.

Type: 1/2 inch display tubes.

Capacity: 12 digits, sign & decimal, 2-digit exponent and sign.

Dynamic Range: $\pm 10^{-98}$ to $\pm 10^{+99}$

Decimal Setting: Automatic floating decimal point from 0 to $\pm 10^{+10}$.

Automatically converted to fixed point from $\pm 10^{+11}$ to $\pm 10^{+98}$.

KEYBOARD

Keyboard: Easily replaceable microswitches with color coded key tops.

Data Entry: Standard 10-key keyboard plus decimal. Exponent can be entered separately. Shifting and exchange between X & Y registers.

Arithmetic: +, -, $\times$, $\div$, X^2 , $\sqrt{x}$, $1/X$

Logarithmic: $\text{LOG}_e X$, $\text{LOG}_{10} X$

Exponential: e^x , 10^x

Miscellaneous: $|X|$, π , Integer of X

Special Functions: 16 changeable special function keys by means of furnished tape programs.

Standard TRIGONOMETRIC:

DEGREES TO RADIANS, RADIANS TO DEGREES, $\text{SIN}(X)$, $\text{COS}(X)$, $\text{TAN}(X)$, $\text{SIN}^{-1}(X)$,

Standard TRIGONOMETRIC (Cont.):

$\text{COS}^{-1}(X)$, $\text{TAN}^{-1}(X)$, RECTANGULAR TO POLAR, POLAR TO RECTANGULAR, $\text{SINH}(X)$, $\text{COSH}(X)$, $\text{TANH}(X)$, $\text{SINH}^{-1}(X)$, $\text{COSH}^{-1}(X)$, $\text{TANH}^{-1}(X)$.

Standard STATISTICS:

x , σ , σ^2 , (ungrouped), x , σ , σ^2 (grouped)

NORMAL DISTRIBUTION, INVERSE NORMAL DISTRIBUTION, X^2 STATISTIC, X^2 DISTRIBUTION, ERROR FUNCTION, BINOMIAL DISTRIBUTION, $N!$, LINEAR REGRESSION, GAMMA FUNCTION, NEGATIVE BINOMIAL DISTRIBUTION, POISSON DISTRIBUTION, RANDOM NUMBER GENERATOR.

Other Functions: Available as programming packages (see price list).

SPEEDS

Function	Approximate Speed
Addition/Subtraction	300 to 500 microseconds
Multiplication/Division, X^2 , $1/X$	2 to 5 milliseconds
10^x , $\text{Log}_{10} X$	15 milliseconds
$\sqrt{x}$	25 milliseconds
e^x , $\text{Log}_e X$	20 milliseconds
Single Variable Trig Functions	135 to 250 milliseconds
Read/write cycle time	2 microseconds

DOUBLE PRECISION (RECALL RESIDUE)

Up to 24-digit accuracy can be gained after +, -, $\times$. Remainder is displayed after $\div$.

MEMORY

The Wang 700A/B contains 8,192 bits of core memory. This is organized as 120 data storage registers; or, as storage for 960 program steps.

Example

100 Steps plus	106 Registers
250 Steps plus	88 Registers
500 Steps plus	56 Registers
750 Steps plus	26 Registers

ADDRESSING STORAGE REGISTERS DIRECT ADDRESSING

(by storage keys and toggle switches)

Operations: Store, recall, or  is performed in one step.

Internal Arithmetic: +, -, $\times$, $\div$ is performed in one step in all 120 registers.

INDIRECT ADDRESSING

Register Address is indicated in the Y-register. It can be listed in the program or manually keyed in.

Operations: Store, recall, or  is performed in one step.

Internal Arithmetic: +, -, $\times$, or $\div$ is performed in one step in all 120 registers.

Subroutines: 64 different subroutines can be addressed manually or programmed from any point in a program by one step using the toggle switches. At the end of a subroutine, a **RETURN** branches back. Two levels of subroutines are possible on the 700A, 5 levels on the 700B.

Step and Display Program: Simultaneously, step and code numbers are displayed for checking and changing individual steps on a random access.

Verify Program: This command accumulates all code numbers of a program. The total is displayed and verifies to the user that he has properly loaded the correct program — also used to by-pass programs.

Recording: A **RECORD PROGRAM** command can record programs from core memory onto a tape cassette.

PROGRAMMING

Method: entered via keyboard into core memory by pressing keys in proper sequence (**LEARN** mode) or by loading of a magnetic tape cassette.

Capacity: In core = 960 steps; on one cassette, 23,000 steps.

Automatic Loading: allows execution of extremely long programs.

Protection: each of the two sides of a cassette can be individually protected as desired.

Commands: A total of 95 different instructions are available from the keyboard.

Unconditional Branching: A **SEARCH XX** statement can be programmed to branch to the corresponding **MARK XX** in a program.

Conditional Branching: **SKIP IF:** $Y < X$, $Y = X$, $Y \geq X$, $Y = 0$, $Y \neq 0$, $X = 0$, $X \neq 0$, Y positive, Y negative, X positive, and X negative are commands used for conditional branching.

Test for Error: **SKIP IF ERROR** tests for illegal mathematical operation, overflow or non-existing address (see next paragraph).

Error Lights: **MACHINE ERROR:** indicates improper loading of tape. **PROGRAM ERROR:** indicates illegal operations (see previous paragraph).

PULL-OUT INSTRUCTIONS

Condensed operating instructions on durable swing-out plastic plates are mounted under the keyboard for quick reference.

PERIPHERALS

Model 701 Alpha/numeric Output Writer, Model 702 Plotting Output Writer (requires 700B), Model 703 Paper Tape Editor, and a Model 704 Card Reader are available (see separate literature).

INPUT/OUTPUT CAPABILITY

An input/output connector located on the rear panel of every Model 700 Series calculator, enables direct interfacing of various external equipment. Through this connector, data information can be received, program operations can be executed, or program steps can be "learned" directly into the core memory. Output information, general data, keyboard executions, and the contents of the X-register display are also available.

Specifications describing the signals and signal functions required and/or appearing at the input/output connector are available upon request.

GENERAL

Dimensions: 8.5 in. high, 20 in. wide, 20.5 in. deep

Weight: Net 35 lbs., gross 58 lbs.

Power: 115 vac $\pm 10\%$, 60 hz, 60 watts (standard)
230 vac $\pm 10\%$, 50 Hz, 60 watts (optional, no charge)

WARRANTY

Full warranty of 90 days for equipment: one year for parts only. Optional maintenance contracts available.

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WANG MODEL 720A/B ELECTRONIC CALCULATOR



The Model 720A/B has been designed for calculator users who require extremely high memory capacity. Basically, an expanded version of the powerful 700A/B, the 720's significant features include twice the memory capacity, 1,984 core-stored program steps, or 248 data storage registers, and 5-level subroutine capabilities. The outward appearances of the 720's retain the same shape and size as the standard 700's. All codes used with the 700's are compatible with the 720's. Peripheral equipment requirements dictate the choice between the A or B models. The Model 720A is compatible with the Model 701 Output Writer only, whereas the 720B is compatible with both the Model 701 Output Writer as well as the Model 702 Plotting Output Writer.

DIRECT ADDRESSING

The first 166 registers (000 through 165) can be addressed directly by using combinations of the toggle switches and the special operation keys. The same "direct operation" keys, such as **STORE DIRECT**, **RECALL DIRECT**, **+ DIRECT**, **- DIRECT**, **x DIRECT**, **÷ DIRECT**, and **↺ DIRECT** are used. Nine new commands have been added which automatically add 100 to the register number selected by the settings of the toggle switches and special operation keys.

SUBROUTINES

Five levels, or five nested subroutines can be accommodated. The machine will remember up to five addresses when a subroutine within a subroutine occurs.

CORE MEMORY (2K Bytes)

The Wang 720A/B contains 16,384 bits of core memory which are organized as 248 data storage registers of 1,984 programming steps.

EXAMPLES:

- If 100 Steps, 234 data storage registers are available.
- If 500 Steps, 184 data storage registers are available.
- If 800 Steps, 148 data storage registers are available.
- If 1,000 Steps, 122 data storage registers are available.
- If 1,500 Steps, 60 data storage registers are available.

INDIRECT ADDRESSING

Indirect addressing is accomplished in the same manner as that used with the Model 700A/B. Addresses (from 000 through 247) are indicated in the Y register.

PROGRAM COUNTER (P. C.)

In the **LEARN MODE**, a 4-digit program step number is displayed in the X register. Four digits are required to set the program counter.

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WANG MODEL 702 PLOTTING OUTPUT WRITER

The Model 702 Plotting Output Writer adds digital plotting (X, Y) and alpha/numeric output writing capabilities to Wang's Model 700B or 720B Programmable Calculator. A true dual-purpose peripheral, the Model 702 can provide any number of alpha/numeric printout and plot combinations, either by program control or manually. Faster and more accurate than an analog plotter, the 702 can produce a wide range of variable spacing plots. A variety of symbols can be used to differentiate between various functions or for superimposing plotting curves. Because plots and printouts can be combined on the same paper, the need is eliminated for time-consuming correlations of plots and printouts from various printout media. Applications for the Model 702 are found in almost every engineering and scientific discipline where the presentation of data in graphic form would be desirable.

The basic machine is an IBM Selectric® typewriter which has been modified by replacing the forward carriage feed and tabulation mechanism with a carriage-drive stepping motor for the X axis and replacing the platen drive by a second stepping motor for the Y axis. Both motors have a stepping rate of 400 steps/second in increments as small as 0.01 inches. The return mechanism enables the carriage to return at a rate of 17 inches per second.

Full capability of the manual keyboard is retained except for tabulation control. This advantage gives the user an additional typewriter during non-plotting and non-calculating periods. Programmable functions include space, backspace, index, reverse index, power on-off, shift down, shift up, and return. The reverse index key (new in design and not available on the Model 701



Output Writer) allows a reverse line feed operation. Space and index functions are conventional.

(X, Y) PLOTTING CHARACTERISTICS

The Model 702 has a four quadrant plotting capability. The origin point can be located anywhere within the parameters of the plotting area (12.25 inches on the X-axis, Y-axis is limited only by the length of the continuous form which is used).

Stepping Rate (X or Y-axis)	400 steps/second (approx. 4 inches/second)
Stepping Increment ($\Delta X, \Delta Y$)	0.01 inch/step
Plotting Time (minimum)	0.1 seconds between plot points
Plotting Accuracy	± 0.010 inches or $\pm .003$ /inch
Dynamic Accuracy	Deviation from straight lines between two data points is less than ± 0.03 inches for data points up to 10 inches apart.
Pin Feed Platen	Vertical spacing between pins is 1/2 inch. Horizontal spacing between pins is 13 1/8 inches.

PROGRAMMING CHARACTERISTICS

Ease and range of programming the Model 702 through the Model 700B calculator provides a convenient and practical method for obtaining many previously impractical plot/print combinations. The following operations are indicative of the output flexibility a user has at his disposal with the Model 702.

Numeric Output with Decimal Point — This operation is controlled by a 2-step command. The **WRITE** key followed by a 4-digit code number will produce a printout of the X register in the desired format. Up to nine characters to either the left or right of the decimal point can be obtained.

Numeric Output with Modified Scientific Notation — This operation is controlled by a 2-step command. The **WRITE** key followed by the code 00 15 will produce a printout of the entire X register in modified scientific notation, regardless of the possible floating decimal point condition of the X register.

Space Function — Any number of spaces from 1 to 15 may be automatically programmed by a 2-step

command. The **WRITE** key followed by the code 15 XX will produce XX spaces.

Alphabetic Output — Alphabetic printouts such as titles can be printed under program control by using the **WRITE ALPHA** command. Each succeeding code number after the initial command will produce an alpha character printout. This mode is terminated by an **END ALPHA** command.

X, Y Plot — Like the alpha mode, an X, Y plot can be programmed by starting with a **WRITE ALPHA** command. Each succeeding code number will produce a character print at an X-Y distance from the previous plot point. The X-Y distance is defined by the integer portions of the X and Y registers, respectively. The series of plot points is terminated by using the **END ALPHA** command. The differentiation between the print and plot mode is made by the code number. A convenient function, called **PLOT**, enables the positioning of the plotter at any X-Y position without actually printing a plot symbol. Since both the alphabetic print and the plot print functions use the same **WRITE ALPHA** command, a user can very conveniently intermix alpha/numeric printout and plot instructions with one-step programming.

ALPHA/NUMERIC OUTPUT WRITER CHARACTERISTICS

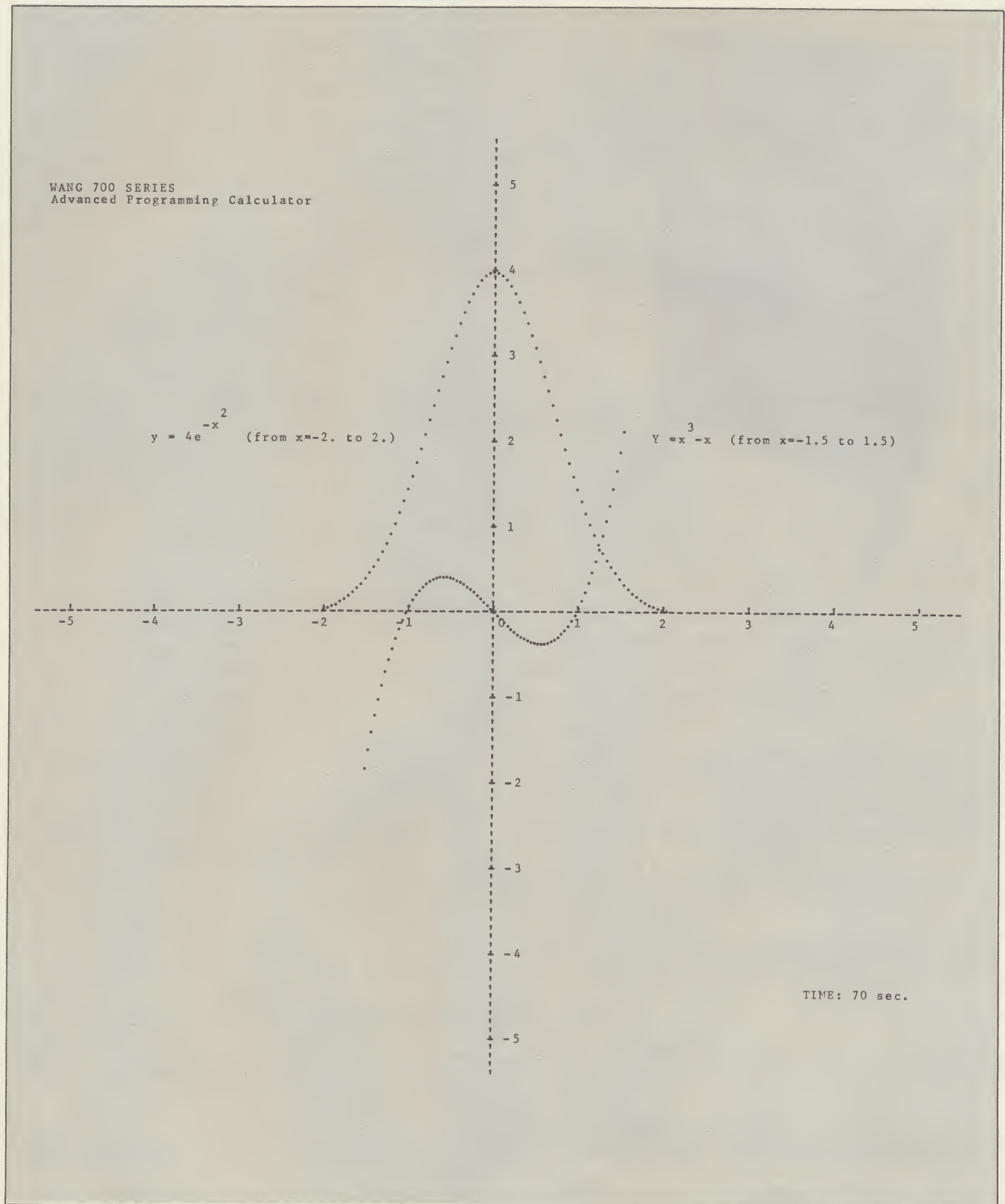
A total of 88 characters (44 lower case and 44 upper case) is available at the keyboard of the Model 702.

Paper Width	13 5/8 inches
Width of Printing Area	12 1/4
Character/Inch	10
Lines/Inch	Approx. 7
Line Pitch	.14 inch
Type Face	IBM Prestige Elite 72 (code 012)
Maximum Printing Speed	Approx. 15.5 characters/second
Space and Back Space Speed	30 milliseconds
Index Speed (forward and reverse)	50 milliseconds
Carriage Return Speed	0.15 seconds plus 60 milliseconds/inch
Weight	Net 96 lbs, gross 140 lbs.
Connecting Cables	12 ft. output connector cable & power supply cord
Power Requirements	115 VAC $\pm$ 10%, 60 Hz, 200 W, 3 Amp. (230 VAC $\pm$ 10%, 50 Hz, 200 W, 1½ Amp. on special order)

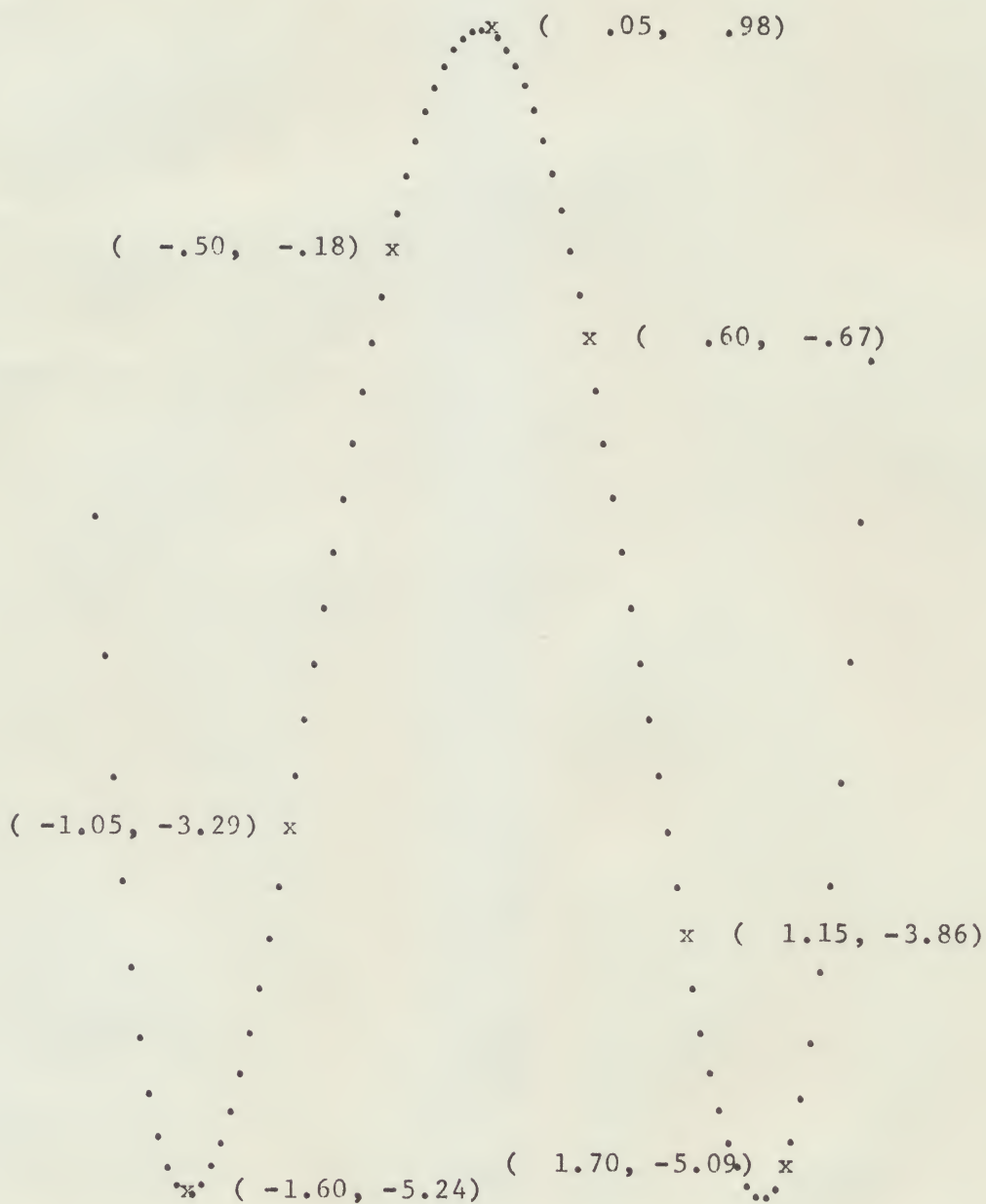
WARRANTY

Full warranty of 90 days for all parts and labor. Optional maintenance contracts are available.

TYPICAL OUTPUT OF A WANG 702 PLOTTING OUTPUT WRITER



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